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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/256,034	02/23/1999	MARIE ANGELOPOULOS	YO998-056	9289

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EXAMINER

CHU, JOHN S Y

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 05/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/256,034

Applicant(s)

ANGELOPOULOS ET AL.

Examiner

John S. Chu

Art Unit

1752

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 February 2005.  
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.  
4a) Of the above claim(s) 9-17 and 19 is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-8, 18 and 20 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

This Office action is in response to the amendment filed February 8, 2005.

1. Claims 1-8 and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention is **withdrawn** in view of the amendment to claims 1 and 7.

#### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-4, 5, 7, and 18 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over VIKESLAND.

The claimed invention is drawn to a method comprising disposing on a surface a layer of material; disposing in said layer of material a resist material; said layer of material having a crosslink density sufficiently high that said layer of material and said resist do not substantially intermix.

VIKELAND discloses in Example 1 of column 6, lines 6-68 a photosensitive coating having two photosensitive layers wherein the first layer comprises a novolak phenolic resin designated as the tradename of “Resinox”. The Examiner notes that there is a presence of DDI-

Art Unit: 1752

1410, which is an aliphatic diisocyanate compound. Polyurethanes are known to be formed by reacting a diol compound with a diisocyanate compound. Clearly coating and heating the novolak resin in the presence of a diisocyanate compound a crosslinking reaction occurs between the novolak resin (having phenolic groups) and the diisocyanate compound in the first layer (see column 5, lines 10 – 54, particularly lines 25-33 for the disclosure of diisocyanates as a crosslinking ingredient. This disclosure is asserted by inherency to meet the claimed “layer of material” coated on the “surface” of claim 1.

The second layer is disclosed in column 6, lines 24-33 comprising a naphthoquinone diazide photosensitizer as the photosensitizer. This photosensitizer would inherently meet the recited material index of refraction as recited in claim 7. The energy beams of claims 5 and 7 are met by the disclosure found in Example 1 wherein it is known that the radiation source is a UV source.

It would have been *prima facie* obvious to one of ordinary skill in the art of photosensitive materials to duplicate the method found in Example 1 to coat a surface wherein the first layer and second layer is crosslinked, thus maintaining separate layers that don't intermix and reasonably expect a photosensitive multiplayer resist material having improved properties and performance as disclosed in VIKESLAND.

The arguments by applicants have been considered, however each of the recited components in the claims above have been disclosed in VIKESLAND and because of the presence of the same type of ingredients and the fact that the dry film resist has no intermixing as disclosed, the claims are asserted by inherency to be present unless otherwise shown by applicant.

Art Unit: 1752

4. Claims 1-5, 7, 8 and 18 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by PAVELCHEK et al (5,939,236).

The claimed invention is drawn to the following

CLAIM 1 (Currently Amended) A method comprising:

disposing on a surface a layer of material said layer of material comprising an optically tuned planarizing polymeric layer comprising a polymeric resin a crosslinking agent and a thermal acid generator;

disposing ~~[[in]]~~ on said layer of material a resist material;

said layer of material having a crosslink density sufficiently high that said layer of material and said resist do not substantially intermix.

Example 4, found in column 18, lines 33-64 anticipates the claimed method of disposing said layer of material comprising an optically tuned planarizing polymeric layer comprising a polymeric resin, a crosslinking agent and a thermal acid generator; disposing on said layer of material a resist material. The property as claimed is asserted by inherency to be present based on the same type of ingredients disclosed in the specification.

The example discloses a resin binder which is a polymeric binder, a crosslinker defined to be Powderlink 1174 and as an acid a p-nitrobenzyl tosylate, seen below:

Art Unit: 1752

## EXAMPLE 4

A further preferred antireflective composition of the invention was prepared by mixing the components set forth below, with component amounts expressed as parts by weight based on total weight of the liquid antireflective coating composition:

1) Resin binder: 2.48% copolymer of 9-anthrylmethylmethacrylate (26mol%) and 2-hydroxyethylmethacrylate (74 mol%)

2) Crosslinker: 0.36% Powderlink 1174 (American Cyanamid)

3) Acid: 0.04% p-nitrobenzyl tosylate

4) Photoacid generator: 0.04% di-t-butyl diphenyl iodonium camphorsulfonate

5) Surfactant: 0.03% FC 431 (3M Co.)

6) Solvent: 97.05% propylene glycol monomethyl ether

The antireflective composition was spin coated onto a single crystal silicon substrate 100 mm in diameter, and baked on a vacuum hot plate at 175° C. for 60 seconds. The resulting thickness was 605 angstroms. Over this antireflective composition layer a commercially available DUV positive photoresist (sold under the tradename of UVIIHS and available from the Shipley Company) was applied to a thickness of 8620 Å after a vacuum hot plate bake at 135° C. for 60 seconds. The overcoated resist layer was exposed to KrF excimer radiation (248 nm) with an ISI XLS projection stepper through a mask patterned with small lines and spaces with a dose of 11.0 mJ/cm<sup>2</sup>. The wafer was then baked on a vacuum hot plate at 130° C. for 90 seconds, and then developed with CD-26 developer (Shipley Co.; alkaline aqueous solution) for 60 seconds. Resist footing was measured by cross-section SEMs for both isolated and dense lines 0.25 µm wide and averaged approximately 12 nm.

5. Claims 1-8, 18 and 20 are rejected under 35 U.S.C. 103(a) as unpatentable over PAVELCHEK et al (5,939,236).

The claimed invention is drawn to the following

CLAIM 1 (Currently Amended) A method comprising:

disposing on a surface a layer of material said layer of material comprising an optically tuned planarizing polymeric layer comprising a polymeric resin a crosslinking agent and a thermal acid generator;

disposing ~~[[in]]~~ on said layer of material a resist material;

said layer of material having a crosslink density sufficiently high that said layer of material and said resist do not substantially intermix.

Art Unit: 1752

PAVELCHEK et al discloses an anti-reflective coating composition overcoated with a photoresist composition. The anti-reflective underlayer comprises a novolac resin, a crosslinker and an acid or thermal acid generating compound. The photoresist composition is subsequently exposed to excimer laser radiation (248 nm) and developed. Applicants are specifically directed to Example 3 found in column 17, lines 10-48 for the preferred anti-reflective composition and photoresist. The resin binder in the anti-reflective underlayer comprises a novolac resin having glycidyl groups and a crosslinker defined as Powderlink 1174 which meets the claimed glycouril component as recited in claim 18, column 13, lines 40-43. The acid ingredient is a p-toluene sulfonic acid and a photoacid generator is disclosed to be a di-t-butyl diphenyl iodonium camphorsulfonate. Applicants are directed to column 11, lines 9-20 for the preferred acid or thermal acid-generating compound. A 2-nitrobenzyl tosylate is recited in Example 4, which anticipates the claimed thermal acid generating compound as claimed.

2-nitrobenzyl tosylate is not explicitly disclosed to be used in a example with a polymeric binder of a novolac resin, however the disclosure clearly motivates the skilled artisan to use such an acid generator as supported above in column 11, lines 9-20. Likewise, the recited polyhydroxystyrene resin binder of claim 20 is not explicitly disclosed in a working example, however column 13, lines 16-22 directs the skilled artisan to use such as resin in the anti-reflective layer, see the insert attached:

While antireflective composition resin binders having such absorbing chromophores are generally preferred, anti-reflective compositions of the invention may comprise other resins either as a co-resin or as the sole resin binder component. For example, phenolics, e.g. poly(vinylphenols) 60 and novolaks, may be employed. Such resins are disclosed in the incorporated European Application EP 542008 of the Shipley Company. Other resins described below as photoresist resin binders also could be employed in resin binder components of antireflective compositions of the invention. 65

Art Unit: 1752

It would have been *prima facie* obvious to one of ordinary skill in the art of multi-layer anti-reflective coatings and photoresist compositions to use substitute the 2-nitrobenzyl tosylate in place of the p-toluene sulfonic acid of Example 3 as a thermal acid generator as motivated its use in Example 4 for the same purpose and column 11, lines 9-20 explicitly stating their functional equivalence and reasonably expect same or similar results with respect to the reduction of footing in a resist relief image.

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. ISHII et al (4,702,992) discloses a photoresist element with an underlayer as claimed having a resin binder and a crosslinking agent. The underlayer lacks the claimed thermal acid generator.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Chu whose telephone number is (571) 272-1329. The examiner can normally be reached on Monday - Friday from 9:30 am to 6:00 pm.

The fax phone number for the USPTO is (703) 872-9306.

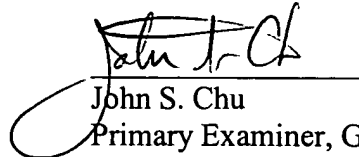
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (571) 272-1700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PMR only. For more information about the PAIR



Art Unit: 1752

system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



John S. Chu  
Primary Examiner, Group 1700

J.Chu  
May 1, 2005